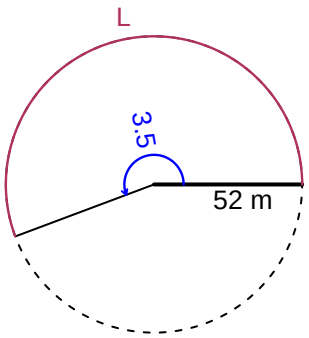
Name: Date:

## Trig Final (Solution v48)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.5 radians. The radius is 52 meters. How long is the arc in meters?

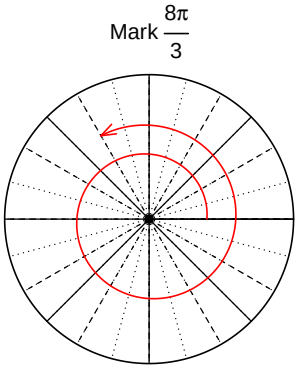



$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

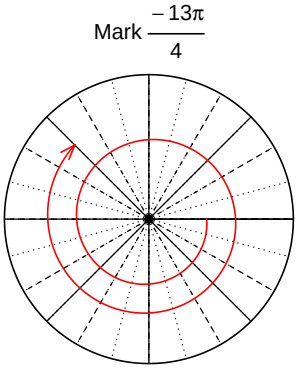
$L = 182$ meters.

### Question 2

Consider angles $\frac{8\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{8\pi}{3}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).




Find $\cos(8\pi/3)$




Find $\sin(-13\pi/4)$

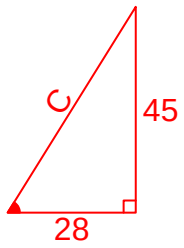
$\cos(8\pi/3) = \frac{-1}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

**Question 3**

If $\tan(\theta) = \frac{-45}{28}$, and $\theta$ is in quadrant II, determine an exact value for $\cos(\theta)$.

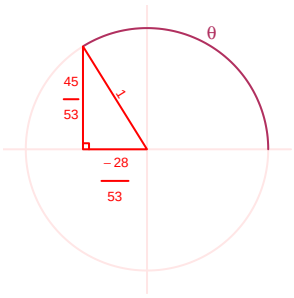
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.




$$\cos(\theta) = \frac{-28}{53}$$

**Question 4**

A mass-spring system oscillates vertically with a midline at $y = -5.41$ meters, an amplitude of 4.4 meters, and a frequency of 3.05 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = -4.4\sin(2\pi 3.05t) - 5.41$$

or

$$y = -4.4\sin(6.1\pi t) - 5.41$$

or

$$y = -4.4\sin(19.16t) - 5.41$$